

NEW DESCRIPTIONS

A NEW HUMAN BLOOD FEEDING BITING MIDGE FROM INDIA, DIPTERA: CERATOPOGONIDAE: *FORCIPOMYIA MANASI*¹

(With three text-figures)

GIRISH MAHESHWARI²

Key words: *Forcipomyia manasi* sp. nov., vector, human

Forcipomyia manasi sp. nov. was collected from the body of Mr. H.R. Sou, a research scholar, while it was feeding on his blood. Host-specificity of the biting midge was further confirmed by the Precipitin Method. Mouth parts and feeding behaviour were found to resemble species of *Culicoides*, which feed on human blood.

INTRODUCTION

Biting midges are vectors of numerous viral, protozoan and helminth pathogens. A number of viruses have been isolated from biting midges, namely the Simbu, Orbivirus, Rhabdovirus and Oropouche groups and specially the *Culicoides* species. The proven association of biting midges with transmission of Oropouche virus in man has now elevated the medical importance of biting midges.

About a hundred species of *Forcipomyia* are reported from the world, of which seventeen are found in India (Borkent and Wirth 1997). The host-specificity of *Forcipomyia* is not very well studied and only a few species are reported feeders on frogs and birds. *Forcipomyia manasi* is perhaps the first record of Forcipomyian biting midges feeding on human blood.

MATERIAL AND METHODS

A wild population of *Forcipomyia manasi* has been used in the present investigation. Fed females of the species were collected from the field, and the Precipitin Method was used to assess the preliminary host-specificity. The material was prepared for taxonomic studies by

the following method adopted by the School of Entomology, St. John's College, Agra, India. Adults were preserved in 70% ethanol and in 4% aqueous solution of formaldehyde (preserves coloration better than alcohol). Before dissection, the material was cleaned in cold KOH (10% solution in water) and 2-propanol. Volsella of male genitalia was removed and mounted separately under a cover slip in lateral view. The genitalia were first mounted laterally in Canada balsam and the shape of the apicolateral process was noted. The male specimen was then reoriented to a dorsoventral position, and females to ventrolateral position. The terminology of Boorman (1990) and Wirth and Messersmith (1971) have been followed.

TAXONOMIC DESCRIPTION

Forcipomyia manasi sp. nov.

Female imago: Length: 1.44 mm. Wing length: 0.75 mm, width 0.35 mm.

Antenna: (Fig. 1a): Scape well-developed, with 8-10 setae; pedicel rounded, width more than length, with 6-7 setae. Flagellum with 13 flagellomeres; flagellomeres 1 to 8 beaded, 1st and 8th subequal, 2-7 wider than long, 9-13 elongated, ultimate flagellomere longest with distinct pointed tip. Length, width of pedicel (mm) 0.030, 0.050. Length, width of

¹Accepted May, 2000

²School of Entomology, St. John's College, Agra 282 002, Uttar Pradesh, India.

NEW DESCRIPTIONS

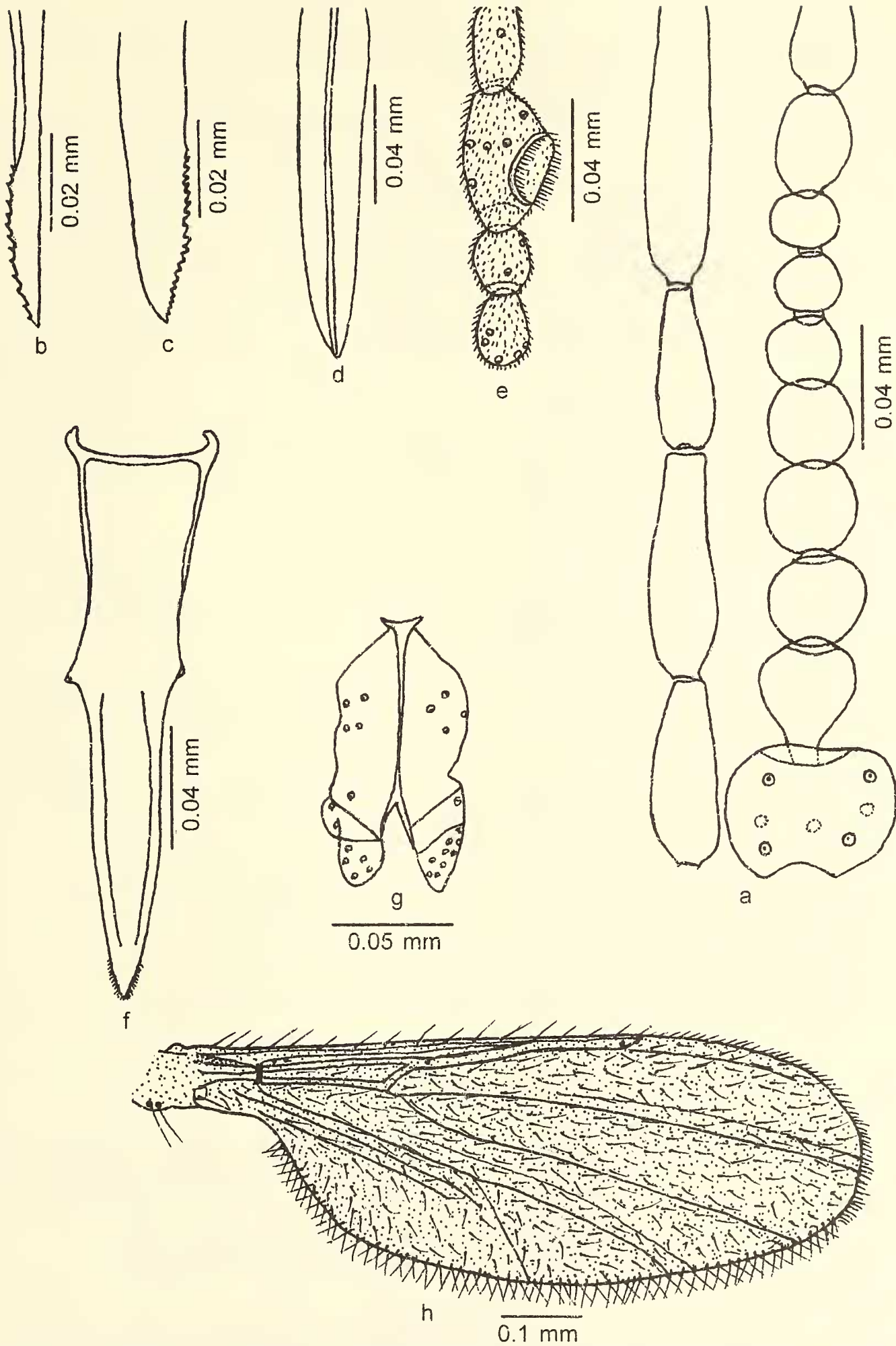


Fig. 1: a. antenna, b. maxilla, c. mandible, d. hypopharynx, e. maxillary palp, f. labrum-epipharynx, g. labium, h. wing

flagellomeres (mm) 0.024, 0.024; 0.013, 0.022; 0.015, 0.021; 0.015, 0.021; 0.015, 0.019; 0.015, 0.018; 0.015, 0.018; 0.018, 0.018; 0.044, 0.016; 0.047, 0.015; 0.052, 0.015; 0.055, 0.015; 0.079, 0.014. AR* = 2.08.

$$*AR \text{ (Antennal Ratio) } = \frac{\text{Terminal elongated flagellomere}}{\text{Rest of the basal flagellomeres}}$$

Head: Coronal suture absent, frontal tubercle present. Temporal setae numerous. Eyes bare, narrowly separated by small bridge, ommatidia moderate. Clypeus broader than long, U-shaped, with 10 setae. Length, width of clypeus (mm) 0.048, 0.079. Maxillary palp (Fig. 1e) with five palpomeres, of which third and fourth are ovoid, the former elongated with a large pit bearing capitate sensilla. Length, width of palpomeres (mm) 0.012, 0.009; 0.024, 0.012; 0.036, 0.020; 0.017, 0.0141, and 0.021, 0.012 and setae 2, 2, 5, 3, 5, respectively.

Proboscis with well-developed cibarial pump and upwardly directed cornua. Mandible (Fig. 1c) strong, serrated with 20-22 small teeth; maxilla (Fig. 1b) scalpel-shaped with 15-17 backwardly directed teeth. Labrum-epipharynx (Fig. 1f) sclerotized apically with pointed hypopharynx (Fig. 1d); labium (Fig. 1g) setose and flappy. Mouth parts adapted for blood-sucking.

Thorax: Humeral pit and parapsidal suture absent. Anteprenotum with 5 setae. Acrostichals and dorsocentralis numerous, scattered, not arranged in rows. Scutellum with two rows of scutellars, mid scutellum bears 8-9 large setae,

and lateral with 7-8 small setae. Anapleural suture present; pre-episternals absent. Postnotum bare.

Wing (Fig. 1h): Light brown; costa large, ending before 2/3 the wing. Radial sector large, densely covered with macrotrichia. First radial cell obliterated, second radial cell compact, R₄₋₅ proximally with light pigmentation, false veins M₁ and M₃₊₄ present. Media bifurcates distal to cross vein r-m. Wing densely covered with fine macrotrichia; microtrichia present on wing membrane. Brachiolum with 28-30 sensilla campaniformia, Radial sector with 3 sensilla campaniformia, Subcosta with two at wing base. Alula without macrotrichia; squama with two elongate setae. CR* = 0.64.

$$*CR \text{ (Costal Ratio) } = \frac{\text{Length of costa}}{\text{Total length of wing}}$$

Legs (Fig. 2i-m): Femora and tibia slightly swollen; fore and hind tibial spurs present, lengths (mm) 0.048, 0.032 respectively; mid tibial spur absent; width at the apex of fore, mid and hind tibia (mm) 0.036, 0.028, 0.028 respectively. Fore tibial comb absent; 5-7 elongated setae present at the apex; hind tibial apex with two combs; first comb with 8 large spines; third spine longest; second comb with 13 small spines. Pseudospurs and palisade setae present on first four tarsomeres; ultimate tarsomere with a pair of markedly curved claws and an empodium. Length and proportions of legs as in Table 1.

Genitalia (Fig. 2n & 3o): Alimentary canal filled with blood. Spermatheca single, circular; spermathecal neck absent. Coxasternapodeme

Table 1: *Forcipomyia manasi* sp. nov., female: lengths (mm) and proportions of legs

Legs	Fe	Ti	Ta ₁	Ta ₂	Ta ₃	Ta ₄	Ta ₅	LR
P ₁	0.265	0.274	0.157	0.068	0.060	0.044	0.044	0.573
P ₂	0.298	0.338	0.153	0.080	0.060	0.048	0.040	0.452
P ₃	0.322	0.322	0.189	0.092	0.068	0.052	0.048	0.587

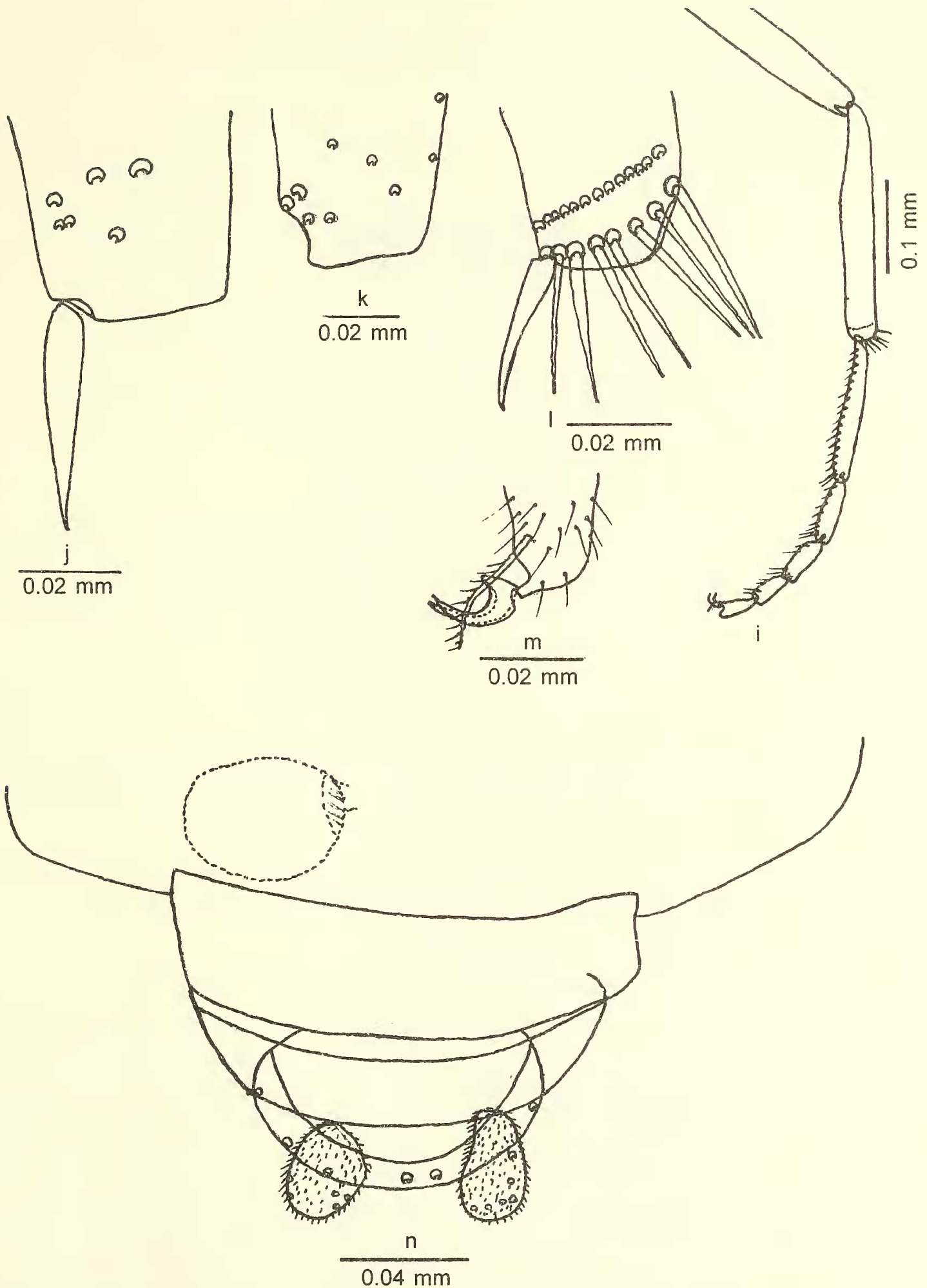


Fig. 2: i. hind leg, j,k,l. fore, mid and hind tibial apex respectively, m. apex of ultimate tarsomere, n. dorsal view of female genitalia

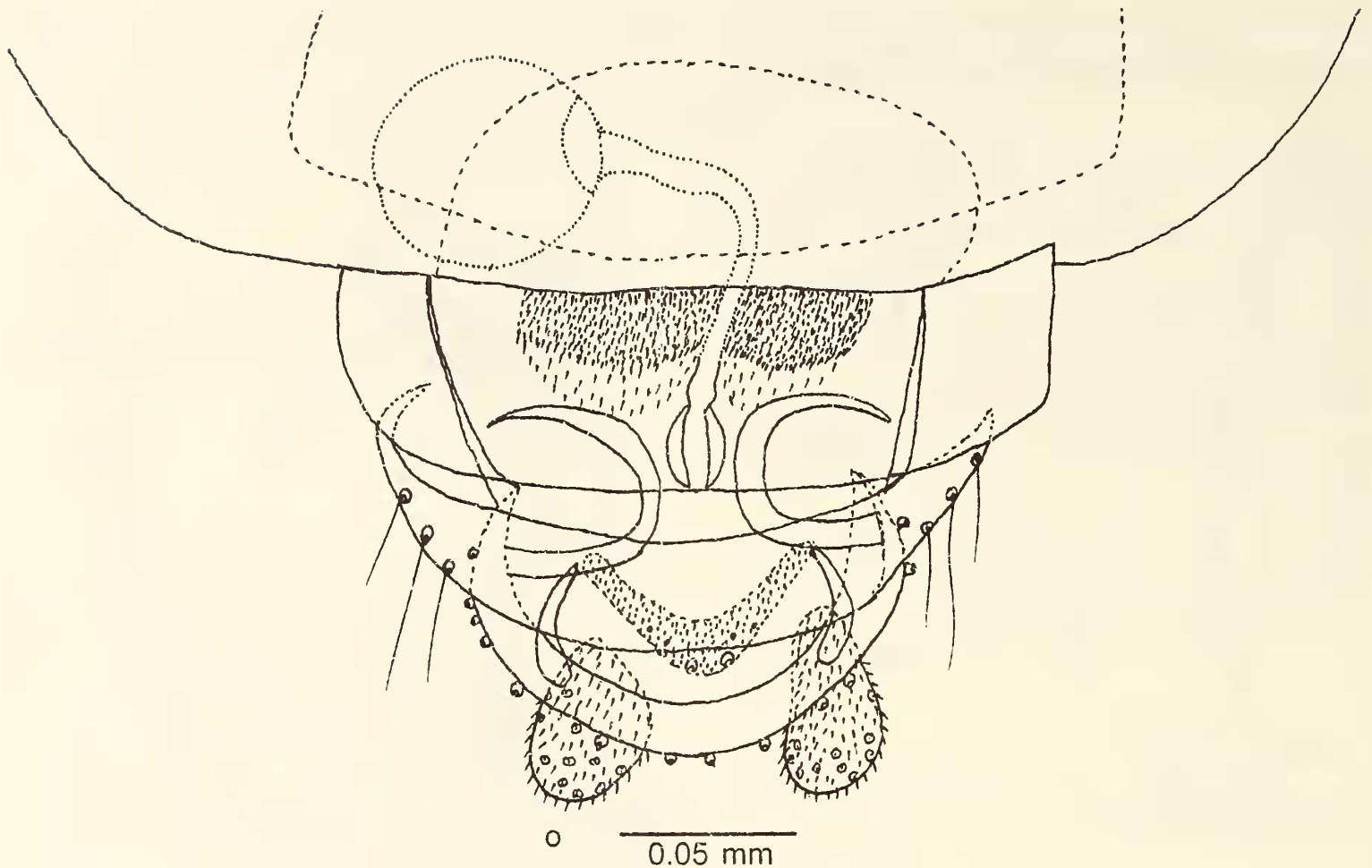


Fig. 3: o. ventral view of female genitalia

highly sclerotized. Gonapophysis VIII divided into dorsal and ventral lobes. Postgenital plate triangular with a pair of strong setae. Cerci club-shaped.

Holotype: ♀ on slide, INDIA: Uttar Pradesh, Agra, St. John's College Campus, 17.viii.1997, Coll. H.R. Sou, Det. Maheshwari, G.

Paratype: ♀ on slide, INDIA: Rajasthan, Camel Farm (Bikaner), 15.x.1997, Coll. H.R. Sou, Det. Maheshwari, G.

Systematics: *F. manasi* sp. nov. is, perhaps, the only known species of *Forcipomyia* which feeds on human blood. According to taxonomic characters, it comes closest to *F. jhapogi* Maheshwari *et al.* Since the species is haematophagous, the abdomen of the female is generally inflated by the accumulation of blood. *F. manasi* can be distinguished by the presence of a single spermatheca, highly sclerotized coxasternapodeme, large sensory pit on third

maxillary palp and U-shaped clypeus. *F. jhapogi* can be separated from *manasi* by the presence of spermathecal neck and antepnotum with eight setae.

Etymology: Since the species feeds on human blood, it is named *manasi*.

DISCUSSION

Only a few species of biting midges are known intermediate hosts feeding on human blood. These are *Culicoides grahamii*, *C. inornatipennis* and *C. austeni*. *Forcipomyia* spp. feed on a variety of hosts such as insects, amphibia, birds and mammals. Those feeding on invertebrates have lacinia with retrorse teeth and coarsely toothed mandibles. *Forcipomyia manasi* sp. nov. is characterised by the margin of the apical portion of the labrum having a continuous row of teeth and the absence of

NEW DESCRIPTIONS

sensilla coeloconica on first flagellomere of the antenna, which indicates its adaptation to feeding on human beings.

The fusion of the ramus with coxasternapodeme IX, the fusion of gonocoxite with tergite IX and absence of gonostylus in the female genitalia is a clear synapomorphy compared with other such as *F. confluens* and *F. conigera*. Presence of a single spermatheca in *F. manasi* and *jhapogi* is an apomorphic character, which isolates them from other spp. of *Forcipomyia*. *F. manasi* also resembles *F. barbipesi* but by the presence of a spermathecal diverticulum, an apomorphic character, *barbipesi*

can be isolated from manasi. The mass culture of the species is being established in the laboratory for further studies on vectorial capacity.

ACKNOWLEDGEMENTS

I thank the Department of Science and Technology (DST), Govt. of India, New Delhi for financial support. I am also thankful to Dr. S.S. Shukla, Department of Forensic Sciences, Institute of Forensic Sciences, Agra for his valuable suggestion to determine host-specificity by the Precipitin method.

REFERENCES

BOORMAN, J. (1990): Two new *Forcipomyia* (*Lasiohelea*) sp. (Diptera: Ceratopogonidae) from Oman. *Journal of Oman studies* 10: 125-130.

BORKENT, A. & W.W. WIRTH (1997): World species of biting midges (Diptera: Ceratopogonidae). *Bull. Am. Mus.*

Nat. Hist. 233: 1-257.

WIRTH, W.W. & D.H. MESSERSMITH (1971): Studies on the genus *Forcipomyia*. 1. The North American midges of the subgenus *Trichohelea* (Diptera: Ceratopogonidae) *Ann. Ent. Soc. Am.* 64:15-26.

